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Herding Cats: Governance Models for the Care and Feeding of Enterprise Resources Planning Systems in Higher Education Institutions

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HERDING CATS: GOVERNANCE MODELS FOR THE CARE AND FEEDING OF
ENTERPRISE RESOURCE PLANNING SYSTEMS IN HIGHER EDUCATION
INSTITUTIONS

BY

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CAPSTONE PROJECT

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ABSTRACT

Enterprise Resource Planning systems (ERPs) have revolutionized the manner in which higher education institutions manage its resources. ERPs provide the mechanism to aggregate disparate data across the institution and deliver reports and facilitate analysis on the institution as a whole. ERPs provide a single source of truth for institutional data enabling an institution-wide view of expenditures and are a powerful tool for decision support. Institutions choosing to invest in implementing ERPs will enter into a long term relationship with continual maintenance of the systems. Key to the success of maintaining ERPs effectively is the governance model an institution adopts for managing the system.

This study surveyed over 300 members of higher education institutions to determine what are the prevalent governance models currently being used and to rate the perceived effectiveness of the models. Additionally the study seeks to identify what governance models will effectively maintain the enterprise resource planning systems of Binghamton University.

The findings reveal the most prevalent model is a centralized governance team with representation from both information technology services (ITS) and functional individuals. In terms of perceived effectiveness a centralized governance model managed by ITS alone is perceived to be most effective. However, based on the literature review and the findings it is recommended that Binghamton University adhere to a centralized governance team with representation from both information technology services (ITS) and functional individuals.

DEDICATION

To: My family for their love and encouragement. Indeed, it was a group effort!

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INTRODUCTION

Imagine a business enterprise comprised of multiple disparate organizations, each with its own business rules and processes, its own goals and objectives, its own methods for collecting, analyzing and reporting on data and each with its own means of communicating information. It could be any business enterprise, a producer of widgets or cars or airplanes. Ultimately all the organizations and their data must roll up and report to the parent enterprise, and somewhere in the business, management would want an aggregate view of how the enterprise is performing en masse and to analyze decision support data for making key decisions. This is a real challenge many enterprises including higher education institutions face everyday.

Higher education institutions produce education and the multiple disparate organizations of an enterprise can be thought of as multiple departments, schools and divisions; each operating under its own unique set of processes and rules. Department chairs and deans are asked to report to senior executives on their effectiveness for meeting institutional objectives and provide valid data to measure the success of the institution's objectives. Senior executives use these reports and data to make key decisions for the institution. The results can be catastrophic and costly if decisions are made based on data that lack validity and reliability. Decisions on how large an entering class should be, decisions to start expensive capital projects based on projections for growth, decisions to hire additional faculty to adjust student-faculty teaching ratios: these types of decisions and more are based in part on data provided to senior management. Indeed the effort to gather the disparate data and to get the different organizations to report in the same manner seems like herding cats in that it is a difficult task and nearly impossible to accomplish.

Many business organizations have turned to Enterprise Resource Planning systems (ERPs) in an attempt to address the challenge of bringing disparate systems and organizations together. ERPs have been utilized successfully in manufacturing environments for many years. They provide a single source of ‘truth’ for the organization by eliminating data redundancy and merging critical financial and human capital resource records together into a unified central system. In addition to integrating and combining multiple disparate systems throughout the organization and providing for the flow of data from one business area to another, ERPs are used by management in the decision making process because they provide an integrated perspective of organizational performance and generate data ripe for analysis and interpretation aiding management in making informed quantitative, pragmatic decisions (King, 2002).

While there exists considerable operational differences between manufacturing environments and higher education institutions, ERP systems have made significant inroads into the hallowed halls of academia and the number of implementations continues to grow both domestically and abroad. The EDUCAUSE Core Data Service survey, published by EDUCAUSE, a nonprofit organization looking to advance higher education by promoting the use of information technology, (EDUCAUSE, 2008) for FY 2005, indicates that 73% of the more than 800 responding institutions reported “having implemented or being in the process or RFP stage of implementing an ERP, with only about 18% reporting no plans to do so” (Hawkins 2006). Furthermore there has been an increase to 48.8% for completed implementations from the previous year’s completion rate of 43.9% (Sullivan, 2008).

Implementing ERP systems represent a huge investment on the part of the institution, with costs averaging in the millions (King, 2002). ERP systems are extremely

complex and require significant time and careful consideration to be appropriately configured; many institutions will perform business process analysis in advance of the implementation to determine the need to continue business as usual or to re-define existing processes to work with the delivered functionality of the system. But it's an investment most are willing to make for the promise of better data and reporting to aid in the success of achieving the institution's goals.

For example, Binghamton University implemented an ERP system in the spring of 2000. The year 2000 (Y2K) concern dominated much of the campus' information technology resources and was one of the drivers for looking at an ERP system. The administration was also looking for a long term solution to its aging and resource intensive legacy system as well as the promise of a truly integrated system to aid in decision support. A request for proposal (RFP) was drafted and Oracle Corporation submitted the winning proposal. The initial RFP included a three pronged approach to an integrated business system including: financials, human resources and a student information system. The student information system was later abandoned in the development phase due to the withdrawal of a key vendor partner in supplying the software and issues with the software.

It was several years after its Oracle ERP implementation when Binghamton began the exploration phase for a student information system, and eventually selected Banner for the system. The University has just completed a successful implementation of Banner with success defined as delivering full system functionality on time and within budget; and while the project is winding down, the real work of owning an integrated system is just beginning (Fitz-Gerald & Carroll, 2003). Binghamton University is entering the

‘care and feeding’ phase of its system and it will require much coordination across many campus offices to successfully grow and maintain the system.

The integrative nature of ERP systems providing for data to flow across many business areas necessitates clear communication and effective governance to be successful in the long term. The leadership must communicate with campus constituencies the methods for entering data into and pulling information out from the system. Great care must be taken to ensure that the data being entered into the system are valid; if data are entered capriciously the results are bad data and produce skewed information. A term frequently used to describe these types of results in data consistency is Garbage In, Garbage Out or GIGO. Data to be analyzed by senior executives in making key decisions for the institution must be reliable or the investment in the ERP system is wasted and the potential for making practical analytical decisions is compromised. The institution’s separate organizations must come together to inspire confidence that the data are accurate and conveying valid information of business performance and an effective governance model is critical to this end.

Choosing an effective governance model is essential to the success of the enterprise wide systems because ERPs are different from other software development projects in that these projects transform the institution’s business processes and will significantly change the organizational structure. Because of the business transformational nature of ERP systems, their failure is more likely to be due organizational, social or even political reasons than to technical or software based causes (Fitz-Gerald & Carroll, 2003). Hence the issue of effective governance models for ERP systems in Higher Education institutions is a real and critical concern facing many universities as they embark on the long term business of ownership.

RESEARCH QUESTION

1. What are the current governance models for maintaining ERP systems in Higher Education institutions?
2. What governance models will effectively maintain the enterprise resource planning systems of Binghamton University?

CONCEPTUAL FRAMEWORK

There are many variables contributing to and concomitantly, hindering, successfully operating and maintaining ERP systems in higher education. Key variables include the support of senior executives, the organization's ability to be responsive to system critical needs, such as installing patches and trouble shooting production issues, utilizing effective methods for communicating information within and across the institution as well as the ability to effectively coordinate and integrate the various modules installed in the system.

Numerous concepts and models have been studied and discussed regarding the diverse aspects of ERP systems. Business process models and re-engineering models, governance models for leadership and other models stressing the interdependent and collaborative efforts required for maintaining ERPs. One such model, governing by network, strives to create an organization that is both nimble and flexible and can respond quickly to changes in the organization's environment. "Thus government by network bears less resemblance to a traditional organizational chart than it does to a more dynamic web of computer networks that can organize or reorganize, expand or contract, depending on the problem at hand." (Goldsmith, and Eggers, 2004, p8).

Likewise, social network theory can be used to explain how information is shared and communicated across organizations. Social network theory provides a unique perspective in explaining how information is communicated and shared in organizations and can help expose potential risks and issues institutions may face in seeking to successfully maintain ERP systems.

LITERATURE REVIEW

Business Process /Business Re-engineering Models

By design, ERP systems are made up of delivered modules, or business applications such as finance and human resources, planned around predefined business process templates with the goal of cutting across existing organizational boundaries thereby allowing for the effective flow of information and the efficient use of data enterprise wide (Fowler & Gilfillan, 2003). Industry best practices are typically used in the creation of these templates and organizations adopt a standard approach to conducting business. The business process template approach will most likely necessitate a change to existing business processes and it is this change that poses a significant challenge to many organizations, higher education included, with implementing and maintaining ERP systems.

A 2002 EduCause Center for Applied Research (ECAR) study found the most commonly stated reasons for implementing an ERP system included "...providing better information for planning and management of higher education institutions; better service to faculty, students, and staff; lowering business risks; and potentially, increasing revenues and reducing costs through greater efficiency...Additionally, ERP systems hold the promise of removing the silo approach to information...and moving to a cross-department system" (King, 2002). Clearly the promise of better information and the

potential to run the organization more efficiently have motivated numerous higher education organizations to purchase ERP systems.

The vision of streamlined processes and best business practices are strong drivers for moving off of legacy systems and onto ERP systems. Unfortunately many ERP systems have not lived up to their promises. One reason may be how best business practices are defined. Best business practices may vary between organizations and most ERP systems were designed for private sector industry, specifically the manufacturing industry, thus creating a challenge for public sector organizations in trying to adapt the systems to meet their requirements (Siau & Messersmith, 2003).

Institutions often fail to grasp the total cost of ownership when purchasing these systems. Total cost of ownership not only includes implementing the systems but the long term costs to maintain them, too. Institutions enter into an expensive and ongoing commitment when they implement an ERP system. Babey (2006) describes three cost phases for ERP implementations; the acquisition phase, the implementation phase and the post-implementation phase; perhaps the costliest phase of the three.

Staffing has been identified as a significant cost for implementing and maintaining ERP systems. Many institutions may underestimate the human resources needed to successfully build these complex systems. New roles are frequently created to manage the ERP system such as a project manager and functional analysts, roles viewed as essential in much of the research conducted on ERP systems in higher education institutions (DeMings, Laidlaw, Lewis, Paris, & Simpson, 2008). “Eighty-two percent of the implementations had an oversight committee...Fifty-five percent of the institutions allocated a full-time manager to the ERP project.” (King, 2002 p 6). The data clearly

demonstrate the need for institutions to plan and budget accordingly for additional staff to maintain the systems.

Some strategies to maximize personnel and contain costs include developing a shared ERP governance model, providing opportunities for ownership across the organization and working to develop and retain key staff (DeMings, et. al., 2008). In many institutions staff and their costs are shared across departments which allow their expertise to also be shared and helps in reducing the need and cost for departments to hire additional staff with similar experience and skill sets. For example, at Binghamton University smaller departments requiring technical services but not requiring a full-time dedicated resource are able to share ITS staffing resources; such as network specialists and developers, by funding a percentage of their salary. Therefore they are able to afford a dedicated technical resource focused on their departmental needs without having to pay for a full-time resource. It's a cost effective method for supporting smaller departments with limited budgets.

Institutions may not have thoroughly considered or fully appreciated the shift to an enterprise-wide change in the way business is accomplished. Transitioning from separate departments and silos to an open information-sharing culture does not happen quickly and may pose challenges for management and employees alike to start thinking of the objectives of the whole institution as compared to their separate organizations. Goldstein (2006) comments on the constant tweaking ERP systems require with continual fine tuning and alteration to maintain system alignment with changing business processes and user needs. In essence the ERP system may be a change agent acting as a catalyst for institution wide changes to business as usual.

Governance Models

The vast majority of current research around ERP systems in higher education institutions focuses on the implementation phase of the system and provides little discussion of the post-implementation phase with regards to issues and challenges. Findings from the literature recommend a continuation of the implementation governance model into the post-production and maintenance stage (Fowler & Gilfillan, 2003). Goldstein (2006) indicates that successful institutions often choose to continue the governance groups created for implementation.

Research has indicated that senior management buy-in and support of ERP systems is requisite to successfully implementing and maintaining these systems. "...The role of management is critical for effective network governance..." (Provan & Kenis, 2005, p 233). Studies have found that institutions typically experience significant changes to their business processes as a result of ERPs and the leading cause of failure for the new systems is the institution's inability to effectively manage the change (Ferrell, 2007). A strong commitment by management to positively deal with the change is imperative; along with instilling a sense of ownership among the key stakeholders in the decision making process is also critical to the success of ERP systems.

Many institutions' governance models are structured in a way that incorporates centralized governance with representation from functional users. The committee approach to decision making can be problematic in the length of time it takes participants to arrive at consensus and secure decisions but this approach may be beneficial in facilitating change precisely because of the inclusion of functional users from across the institution and the sense of system ownership it imbues.

Recent literature discusses the model of governing by network. Provan and Kenis (2005) discuss how the network is viewed as a mechanism of coordination and collaboration and a unique form of governance. Network governance has grown in use in the public sector as a result of the challenges brought about by the complex demands of rapidly changing technology and the pressure on organizations to deliver services more effectively and efficiently. “This push and pull is gradually producing a new model of government in which executives’ core responsibilities no longer center on managing people and programs but on organizing resources, often belonging to others, to produce public value.” (Goldberg & Eggers, 2004, p 8). Many higher education institutions are public sector and hence the issues and challenges presented here are relevant.

Goldberg and Eggers (2004) cite four trends that have led to the rise of governing by network in the public sector: Third-party government, Joined-up government, Digital revolution and Consumer-demand

The first trend, third-party government, points to the increase in the use of third-party vendors or contractors to deliver services. Higher education institutions consistently rely on third-party contractors to aid in maintaining their ERP systems, such as during an upgrade when outside consulting resources are utilized to deliver the upgrade on time and within budget.

Joined-up government refers to many organizations within government who join together to provide services to clients. This is no different than higher education institutions who work to provide integrated services. The concept of one-stop shopping where students can go to enroll, register, and pay for courses in one location as opposed to visiting each separate office within the institution. This is one of the goals for

implementing ERP systems; being able to provide students with a better overall educational experience.

The digital revolution relates to the rapid pace of changing technology and the resulting dynamic effects. Dynamic here refers to the ability for instantaneous or real-time updates to the systems. This places enormous pressure on institutions to conduct business in a near 24/7 operating mode.

Lastly, consumer demand involves increased citizen demand for more control over their lives and more choices and varieties in their governmental services, matching their experiences in the private sector with customer service (Goldberg and Eggers, 2004). Higher education institutions must keep pace with student expectations to maintain their edge in the ever increasing competitive academic environment. For example, students expect to be able to register for their courses at 2 am on a Sunday, consequently institutions must be ready to support the demands this places on their systems and operate with an organization that can respond quickly to any issues that may arise as a result. “Networks, in contrast, tend to be more nimble and flexible than hierarchies” (Goldberg and Eggers, 2004, p 31).

Governing by network poses challenges as well as benefits. One challenge is many organizations are structured to operate in a hierarchy and this model conflicts with the hierarchical approach. Managers must learn to manage networks of resources as opposed to personnel in divisions or departments. The challenges can be as simple as who should be invited to meetings, to purchasing scalable hardware that can grow with the institution’s computing needs. Relying on established hierarchies may not provide an accurate picture of who the players are. The established hierarchy may mask the real

network, the social network where knowledge and information is communicated across organizations.

Network governance also requires the building and maintaining of informal networks outside of the mainstream agencies so as to influence the political players of the institution (Fowler & Gilfillan, 2003). These informal social networks can be powerful in wielding influence and integral in the sharing and distribution of information. “When supported by good communication and knowledge management tools, this expanded contact with the client leads to enhanced information about customer concerns and attitudes, which in turn boost innovation and responsiveness, as well as spread successful practices more quickly. In this way, networks foster learning and continuous improvement by providing more timely access to a broader knowledge base than is possible within a single organization” (Goldberg and Eggers, 2004, p 31).

Social Network Model

Social network theory seeks to identify common social networks within organizations for the purpose of utilizing these pathways in providing greater effectiveness and efficiency in the sharing of knowledge and information and at the same time uncovering and reducing bottlenecks to communications within the organization. The process of social network mapping is utilized to produce diagrams of network paths inside the organization to illustrate the various connections being used by employees. Once the social network mapping has been analyzed management may seek to replicate the networks that are deemed successful and ameliorate perceived weaknesses to the networks.

Business organizations and higher education intuitions share similar characteristics with regards to social network theory; social network theory may help

explain communication of information in higher education institutions. There are formally established networks for communicating business wide information and there are the informal networks for transferring information between groups and individuals. More often than not it is the informal networks that are relied on to provide critical information and to bridge existing knowledge gaps (Cross & Parker, 2004).

Social networks are established for many reasons; they can be used to create relationships across the hierarchy and organizational boundaries, to form coalitions and partnerships (Cross & Parker, 2004). Due to the integrative nature of ERP systems, creating relationships across the institution is important for maintenance as well as communication purposes. “Institutions that have been able to take a learner-centered approach to delivering functions and services have achieved considerable success whereas those that attempt to implement enterprise systems without addressing their internal silos have not” (Ferrell, 2007).

Breaking down silos, the notion of minimizing the effects of separate and distinct entities within an organization has long been considered an issue for many organizations and a barrier to effectively running the enterprise. For example at Binghamton University’s Information Technology Services organization, there are multiple units that constitute the entire organization. The effect of each silo acting independent of the other as opposed to working interdependently and collaboratively toward the shared goals of the organization, limits the potential for greater synergy. Social networks reach across organizational boundaries thus reducing the silo mentality and ameliorating organizational effectiveness.

Research has shown a solution to assuaging the effects of the silo approach is to involve stakeholders. These are the individuals who have an interest in or a stake in the

outcome of the ERP systems. In higher education institutions stakeholders may include senior management, third party consultants, deans, department chairs, administrative assistants, secretaries, and students. The process of stakeholder mapping, similar to social networking, can be vital in understanding the key players both internal and external to the institution. "...strategies for managing stakeholder relationships: for example, engaging the participation of powerful supportive stakeholders while simultaneously attempting to deal with opponents through processes of communication and education" (Fowler & Gilfillan, 2003).

Scholarly information regarding ERP systems continues to grow but is a relatively recent field of study, with much of the literature focused on ERP systems in manufacturing settings, hence there exist limited research conducted on the use of ERP systems in higher education institutions (Siau & Messersmith, 2003). The implication this has for higher education institutions is the findings may not be as applicable in public sector environments.

METHODOLOGY

Data Collection Methods

Data for this capstone were obtained by means of a survey (Appendix A). A survey was used because the researcher deemed it the most effective way to collect information from many institutions in answering the research question regarding governance models and its effectiveness in maintaining ERP systems in higher education institutions (Schutt, 2004). Using a survey also facilitated analysis of the data with the use of inferential statistics. "Inferential statistics are used to infer something about the population based on the sample's characteristics" (Salkind, 2004, P150). The Binghamton University Human Subjects Research Review Committee reviewed and approved the survey

questions to ensure participation in the survey did not pose a risk to participants (Appendix B).

The survey was distributed by electronic mail to the 15,966 members of the Higher Education Users Group (HEUG), a not for profit organization for institutions of higher education that are licensed to use Oracle Corporation software and applications. Participation in the survey was voluntary and participants were apprised of the purpose of the survey in the introductory message. The survey was designed and developed using SurveyMonkey, <http://www.surveymonkey.com/>, an on-line site which facilitates the composing of professional quality surveys quickly and easily (SurveyMonkey, 2008). Participants were given one week to complete the survey and a reminder message was sent to participants three days after the initial email. Research has shown a positive effect in response rates when participants receive a reminder message (Kaplowitz, Hadlock, Levine, 2004). The survey garnered a total of 312 responses, a response rate of approximately 2%. A complete listing of self-identified institutions and descriptive statistics are located in Appendices E and F.

The survey collected information from the participants on governance models used to maintain ERP systems in higher education institutions and the model's perceived effectiveness. Effectiveness was defined as being at the current patch level and/or current production release; this definition was chosen as it represents a norm for maintaining vendor product support, in other words, the institution is up to date with all current changes to the software. Remaining current with patch sets and release levels is important if an institution encounters issues with its software, the first question typically asked by the vendor is what version and patch set are they currently running in production. If the institution is behind current levels then additional resources will be

needed to bring the institution up to date with patch sets before the current issues can be resolved.

The data collected from the survey were compiled and coded to facilitate analysis using SPSS. Data were analyzed using two tests of inferential statistics; simple ANOVA and ordinary least squares (OLS) regression. Governance model 2, centralized with ITS and functional representation, was chosen to be the comparative variable because it is used by 198 of the respondents, $n = 283$ (governance model 6, other, was omitted from the regression analysis).

Table 1Independent Variables to determine relationship on effective maintenance of ERP Systems

Variable	Description	Survey Choices/Coding	
Governance Model	What governance model is used for maintaining the system	<ul style="list-style-type: none"> Centralized team/1 Centralized team with ITS/Functional representation/2 Centralized with ITS/3 Centralized with Functional/4 Decentralized ITS/Functional/5 Other/6 	
Institution FTE	Number of full time students enrollment	<ul style="list-style-type: none"> < 1000/1 1000–5000/2 5000–10,000/3 	<ul style="list-style-type: none"> 10,000–15,000/4 15,000–20,000/5 > 20,000/6
Private or Public Funding	Is the institution privately or publicly funded	<ul style="list-style-type: none"> Private/1 Public/2 	
Length in production	How long has the system been in production	<ul style="list-style-type: none"> < 1 yr/1 1 – 3 yrs/2 3 -5 yrs/3 	<ul style="list-style-type: none"> 5 -7 yrs/4 7 – 10 yrs/5 > 10 yrs/6

Hypotheses and Expectations

A simple ANOVA test (table 1) was used to test several hypotheses about the perceived level of effectiveness in maintaining ERP systems. Table two lists the hypotheses.

Table 2 Hypotheses and Expectations

Grouping Variable	Hypothesis
1. Governance model	Average effectiveness of maintaining ERP systems will vary based on governance model used
2. Institution Full Time Enrollment (FTE)	Average effectiveness of maintaining ERP systems will vary based on institution size.
3. Private or Public Funding	Average effectiveness of maintaining ERP systems will vary based on institution funding (private or public).
4. Length of systems in production	Average effectiveness of maintaining ERP systems will vary based on the length of time systems have been in production.

Limitations

All of individuals surveyed for this research are running Oracle Corporation applications as opposed to Sungard, SAP, Jenzabar, etc...and this may influence the results. Additional research will be necessary to further study ideal governance models

for maintaining ERP systems in higher education institutions with regards to other ERP vendors.

FINDINGS

Simple ANOVA

The following table provides a summary of the simple ANOVA based on the data analysis and if the hypothesis are supported; complete simple ANOVA findings are located in Appendix C. Two of four hypotheses; governance models and length of time the systems are in production affect the success of ERP models.

Table 3 Simple ANOVA results

Hypothesis	F	P	Finding
1. Governance	5.111	p = .000	Supported
2. FTE	.620	p = .685	Not Supported
3. Public or Private Funding	1.374	p = .242	Not Supported
4. Length in production	2.258	p = .049	Supported

Effectiveness of maintaining ERP systems

Hypothesis 1 indicates that governance models affect the effectiveness of maintaining ERP systems. This finding is important to higher education institutions because it supports the need to put into operation the ‘right’ governance model. The literature also supports this finding, “A governance mechanism is needed to allocate scarce resource and to establish priorities for enhancements and extensions of capability (Goldstein, 2006, p. 55).

Hypothesis 2 indicates the effectiveness of maintaining ERP systems does not vary based on institution FTE. The implication this finding has for higher education institutions is that whether the institution is small or large will not impact the effective

maintenance of their ERP systems. Recent research discussed in the 2008 HEUG Whitepaper, *Effective ERP Practices for the Small Institution*, recommends the development of a shared governance model to promote ownership across the institution.

Hypothesis 3 indicates the effectiveness of maintaining ERP systems does not vary based on the institution's funding, public or private. Given the current global economic crisis and the impact this is having on the operating budgets of many institutions, it is imperative to manage systems efficiently and effectively. Regardless of whether the institution is privately or publicly funded, resources must be managed carefully to protect the investment the institution has made in the ERP system. While ANOVA testing did not support the hypothesis the regression analysis findings indicate there exists a negative marginally significant relationship with this variable (see below).

Hypothesis 4 indicates that the length of time the ERP systems have been in production affect the effectiveness of maintaining the systems. The implications for higher education institutions will fluctuate depending on the significance of the relationship. To determine this impact regression testing was also used and we will turn our attention to these findings.

Regression Analysis

The following table displays the findings from regression testing with the significant findings shaded in dark gray and marginally significant findings shaded in light gray. Findings for the significant and marginally significant variables will be discussed below. Multiple regression involves the development of models to predict outcomes based on independent variables (Salkind, 2004).

Table 4 Variables and their significance

Model		Unstandardized Coefficients		Standardized Coefficients Beta	t		Sig.
		B	Std. Error		B	Std. Error	
1	(Constant)	2.739	.254		10.802		.000
	G1	-.550	.194	-.165	-2.839		.005
	G3	.547	.193	.164	2.839		.005
	G4	.403	.371	.062	1.085		.279
	G5	.249	.143	.101	1.739		.083
	Public Private	-.184	.100	-.107	-1.845		.066
	Institution FTE	-.014	.030	-.027	-.468		.640
	Length in Production	-.106	.036	-.172	-2.994		.003

- a. Dependent Variable: Effective ERP Maintenance
b. Selecting only cases for which Governance Model <= 5
c. R² .106

Length of time the applications have been in production is a significant variable in predicting the effectiveness of maintaining ERP systems. The findings indicate that for every unit increase in length in production, a -.106 unit decrease in effective ERP maintenance is predicted. The findings indicate there is a negative significant relationship between length the applications have been in production and the effectiveness of maintaining the ERP systems.

Governance models G1 is a significant variable in predicting the effectiveness of maintaining ERP systems. The findings indicate that compared to governance model 2 a -.550 unit decrease in effective ERP maintenance is predicted. The findings indicate there is a negative significant relationship between using a centralized dedicated governance team model and the effectiveness of maintaining the ERP systems. Governance model G3 is a significant variable in predicting the effectiveness of maintaining ERP systems. The findings indicate that compared to governance model 2 a .547 unit increase in effective ERP maintenance is predicted. The findings indicate there is a positive significant relationship between using a centralized ITS representation governance model

and the effectiveness of maintaining the ERP systems. Governance model G5 is a marginally significant variable in predicting the effectiveness of maintaining ERP systems. The findings indicate there is a positive significant relationship between using a decentralized governance model with ITS and functional representation and the effectiveness of maintaining the ERP systems.

Institution's funding status, whether it is privately or publicly funded, is a marginally significant variable in predicting the effectiveness of maintaining ERP systems. The findings indicate there is a negative significant relationship between institution funding status and the effectiveness of maintaining the ERP systems.

Based on the regression analysis the most effective governance model for maintaining ERP systems is G3, a centralized model headed up by information technology services staff. This implies use of this model will predict a positive increase in the perceived effectiveness of maintaining the ERP systems.

The majority of respondents indicated their institutions practice governance model G2, centralized with representation from ITS staff and functional staff. There may be political or social implications for this and majority use of this model may be attributable to the collegial environment existing in academic institutions where inclusion and representation from key stakeholders is promoted and valued.

It is interesting to note that governance model G1, centrally by a management team whose primary role is to maintain the system, indicates a negative relationship with predicting effectiveness for maintaining ERP systems. Further empirical research would be indicated to offer a plausible explanation for why this is so.

The implications these findings signify for higher education institutions are interesting. Based on the regression analysis the longer your ERP systems are in

production the less effective the maintenance of the systems is. There could be many reasons that offer an explanation as to why this is so but again, without further analysis it would be pure speculation. The regression analysis simply state there exist a negative significant relationship between the two variables.

RECOMMENDATIONS

The findings of this study lend themselves to some recommendations for higher education institutions: governance models do impact perceived effectiveness for maintaining ERP systems, institutions should recognize the length of time the systems have been in production as it impacts the perceived effectiveness for maintaining ERP systems and even though a centralized governance model with ITS staff is the most effective model, Binghamton University should continue its use of a centralized governance model with representation from ITS and functional staff due to the institution's practice of inclusion and cultural considerations.

Recommendation 1

Higher education institutions should review their current governance models to determine if they are effective in maintaining the ERP system. Specifically institutions should review current patch levels and release versions of the products as a way to gauge if they are keeping pace with vendor fixes and enhancements to the applications. Staying current with product maintenance will better position the institution should they encounter major issues to their production environment and need immediate support. The consequences of taking the ERP systems off-line for a period of time to resolve issues could result in lost revenue and could diminish the public's perception of the institution's ability to effectively manage its resources. Also failed ERP implementations

or failed upgrades are often times published in the *Chronicle of Higher Education* and this could considerably damage an institution's image, thus impacting potential rankings such as those listed in *US News and World Reports* college rankings issue and possibly impacting potential applications to the institution.

Institutions should also meet with their governance teams on a periodic basis to ensure the goals of the team are aligned with the goals of the institution. The literature indicates a collaborative approach is successful in maintaining the systems; "It requires collective action and the governance of these activities...it is critical for effectiveness" (Provan & Kenis, 2005, p 231). Binghamton University uses a centralized governance model with representation from both ITS and functional area leads. In addition there exists an organizational team whose role is to provide strategic guidance and vision to the governance team for the direction and development of its business systems.

Recommendation 2

Higher education institutions should assess the efficacy of their ERP maintenance as their use of the applications becomes more mature. The findings indicate a decrease in perceived effectiveness for maintaining ERP systems based on length of time the applications have been in production. The longer the systems are in place the more lackadaisical the institution may become in maintaining their systems, however; this correlation is speculative and additional research is warranted to better understand the causal factors of this finding.

Binghamton University's ERP systems have been in production since 2000. Based on the findings this puts them at risk for experiencing diminished effectiveness in maintaining their ERP systems. Binghamton University should remain diligent with their maintenance of the systems and make it an institutional priority to stay current with

critical patches as they are released by the vendor. Senior level support is recommended to obtain this objective. Periodic reviews of its maintenance procedures will also ensure Binghamton University remains effective with system maintenance.

Recommendation 3

Binghamton University should continue to use a centralized governance model with representation from ITS and functional staff. It is important to note that while the data analysis indicate a centralized ITS governance model was predicted to be the most effective model for maintaining ERP systems, the centralized ITS and functional representation governance model is also effective in maintaining systems and may provide a greater sense of ownership from campus constituencies because it is inclusive of more key stakeholders. The viability of productively maintaining the ERP systems is ultimately contingent on user agreement and participation for using the systems properly.

If Binghamton University should choose to pursue transitioning from a centralized ITS and functional representation governance model to a centralized ITS governance model it should be done incrementally over time by employing a change by attrition strategy whereby current functional members rolling off the governance team would not be replaced by another functional representative but rather an ITS staff or leaving the seat vacant. Incremental change is most often a successful approach for implementing change in large organizations (Andersen, 2003).

Executive level management must also continue to communicate their support of the systems and set the tone for campus wide adoption of the systems. “A successful ERP project requires the functional and technical leadership and teams to develop a strong partnership and a shared commitment to its success. The partnership at the top provides the necessary foundation” (Swartz & Orgill, 2001). If their support is not

explicit and consistent, the institution runs the risk that the campus community will not fully utilize the systems as they were designed and intended to be used and could undermine the validity of the data to be mined, thus compromising the decision support benefits of the systems.

Binghamton's utilization of a centralized governance model with representation from ITS and functional area subject matter experts has been successful in maintaining its systems. However it is Binghamton's ITS staff, specifically their data base administrator (DBA) that presents the governance team with a recommended patching strategy and timelines for testing and moving the patches into the production environment. This patching process, with guidance and direction from the DBA, supports the findings of the regression analysis in predicting a governance model of centralized ITS staffing as the most effective model in maintaining ERP systems.

CONCLUSION

The number of higher education institutions implementing or already running ERP systems continues to grow. It is an enormous investment for institutions to make and a decision that requires thoughtful, comprehensive planning and analysis before 'signing on the dotted line'. Once the decision has been made and the monies paid, it is incumbent on the institution to safeguard its investment. One mechanism for shepherding the systems successfully is to utilize governance models that enhance the effectiveness of maintaining the systems. This study presented findings that may help institutions in selecting the governance models to best maintain their ERP systems. Specifically for Binghamton University the findings support its use of a centralized governance model with representation from ITS and functional staff in effectively maintaining its systems. Based on the findings related to the length of time the ERP

systems have been in production, Binghamton University should remain vigilant and periodically review its patching processes to ensure they are effective in meeting the goals of the institution.

Institutions may recognize tremendous benefits from using the data mined from the systems if it is cared for and maintained effectively. From departments agreeing to use standard data entry methods for an address field to agreeing on reporting styles, there is much to be gained. Collaboration in the use of ERP systems throughout the campus is imperative, both in terms of governance and support. Moving away from institutional silos and into a network governance model of shared information and resources holds the promise for creating opportunities for the institution to redefine and streamline business processes and utilize resources more effectively. It offers the opportunity to harness the synergy of a collective environment.

Appendix A—Survey

Governance Models for ERP Systems in HE [Exit this survey](#)

Thank you for taking the time to participate in a short survey to collect information on governance models and their effectiveness in the maintenance of Enterprise Resource Planning (ERP) systems at public and private higher education institutions.

This voluntary survey will take less than 5 minutes to complete and the results from your responses will contribute to research on ERP post-implementation experiences in higher education institutions.

This masters research study has been reviewed and approved by the Binghamton University Human Subjects Research Review Office. Questions or concerns about research participants' rights may be directed to

ITC Alpha Building Room 2205

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Binghamton NY 13902-6000

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<http://humansubjects.binghamton.edu>

hsrrc@binghamton.edu

My faculty supervisor is Dr. David Campbell, Assistant Professor, CCPA Public Administration,

dcamp@binghamton.edu

Thank you again for taking the time to participate.

Sincerely,

Paula Russell

Business Systems Coordinator and MPA Candidate, College of Community
and Public Affairs,
Binghamton University

1. Contact information (optional)

Name:

Institution:

Email Address:

Phone Number:

2. Is the institution public or private

3. Institution Size (FTE)

4. Carnegie Classification (a framework for grouping colleges and universities for research purposes):

5. Which ERP modules are currently in production at your institution, select all that apply

6. How long have these systems been in production

7. Which Governance model best describes how your systems are currently maintained

8. Which choice best describes how this governance model was selected

9. Is the current governance model the same as was used during the implementation of these systems

10. How frequently are the systems maintained (patch/upgrade)

11. How effective is your institution's governance model in maintaining these systems. Effectiveness may be defined as being at the current patch level and/or current production release

12. Who makes the decision to patch/upgrade the system

13. Do formal networks exist within the institution to share/communicate information regarding system status/maintenance

14. Please rank the most utilized methods for communicating information within the governance team with 1 being the most utilized and 5 being the least utilized

15. Please rank the most utilized methods for communicating information regarding system maintenance throughout the institution with 1 being the most utilized and 5 being the least utilized

**Appendix B— Binghamton University Human Subjects Research Review
Committee Form**

From: Casella, Anne
Sent: Friday, October 17, 2008 8:26 AM
To: Russell, Paula
Cc: Campbell, David
Subject: Human Subjects Research Review Approval
Date: October 17, 2008

To: Paula Russell, CCPA/MPA Program

From: Anne M. Casella, CIP Administrator
Human Subjects Research Review Committee

Subject: Human Subjects Research Approval
Protocol Number: 1051-08
Protocol title: *Herding Cats: Governance Models for the care and feeding of
ERP systems in higher education*

Your project identified above was reviewed by the HSRRC and has received an Exempt approval pursuant to the Department of Health and Human Services (DHHS) regulations, 45 CFR 46.101(b)(2) .

An exempt status signifies that you will not be required to submit a Continuing Review application as long as your project involving human subjects remains unchanged. If your project undergoes any changes these changes must be reported to our office prior to implementation.

Any unanticipated problems and/or complaints related to your use of human subjects in this project must be reported, using the form listed below,
<http://humansubjects.binghamton.edu/Forms/Forms/Adverse%20Event%20Form.rtf>
and delivered to the Human Subjects Research Review Office within five days. This is required so that the HSRRC can institute or update protective measures for human subjects as may be necessary. In addition, under the University's Assurance with the U.S. Department of Health and Human Services, Binghamton University must report certain events to the federal government. These reportable events include deaths, injuries, adverse reactions or unforeseen risks to human subjects. These reports must be made regardless of the source of funding or exempt status of your project.

University policy requires you to maintain as a part of your records, any documents pertaining to the use of human subjects in your research. This includes any information or materials conveyed to, and received from, the subjects, as well as any executed consent forms, data and analysis results. These records must be maintained for at least six years after project completion or termination. If this is a funded project, you should be aware that these records are subject to inspection and review by authorized representative of the University, State and Federal governments.

Please notify this office when your project is complete by completing and forwarding to our office the following form:

<http://humansubjects.binghamton.edu/Forms/Forms/Protocol%20Closure%20Form.rtf>

Upon notification we will close the above referenced file. Any reactivation of the project will require a new application.

This documentation is being provided to you via email. A hard copy will not be mailed unless you request us to do so.

Thank you for your cooperation, I wish you success in your research, and please do not hesitate to contact our office if you have any questions or require further assistance.

Cc: file
David Campbell

Anne M. Casella, CIP
Administrator
Human Subjects Research Office
Binghamton University
ITC Room 2205
casella@binghamton.edu
Telephone (607) 777-3918
FAX (607) 777-5025

Appendix C—ANOVA results

ANOVA—governance models

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	18.416	5	3.683	5.111	.000
Within Groups	220.504	306	.721		
Total	238.920	311			

ANOVA—public private

ANOVA

Effective

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.055	1	1.055	1.374	.242
Within Groups	237.865	310	.767		
Total	238.920	311			

ANOVA—duration

ANOVA

Effective

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.502	5	1.700	2.258	.049
Within Groups	230.418	306	.753		
Total	238.920	311			

ANOVA—FTE

ANOVA

Effective

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.396	5	.479	.620	.685
Within Groups	236.524	306	.773		
Total	238.920	311			

Appendix D—Regression analysis

Variables Entered/Removed (b)

Model	Variables Entered	Variables Removed	Method
1	Length Production, Institution, G4, G3, G1, Public Private, G5, G5(a)	.	Enter

a All requested variables entered.

b Dependent Variable: Effective

c Models are based only on cases for which Governance Model <= 5

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.326(a)	.106	.084	.820

a Predictors: (Constant), Length Production, Institution, G4, G3, G1, Public Private, G5

ANOVA(b)(c)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.018	7	3.145	4.681	.000(a)
	Residual	184.808	275	.672		
	Total	206.827	282			

a Predictors: (Constant), Length Production, Institution, G4, G3, G1, Public Private, G5

b Dependent Variable: Effective

c Selecting only cases for which Governance Model <= 5

Coefficients(a)

Model		Unstandardized Coefficients		Standardized Coefficients		t	Sig.
		B	Std. Error	Beta			
1	(Constant)	2.739	.254			10.802	.000
	G1	-.550	.194	-.165		-2.839	.005
	G3	.547	.193	.164		2.839	.005
	G4	.403	.371	.062		1.085	.279
	G5	.249	.143	.101		1.739	.083
	Public Private	-.184	.100	-.107		-1.845	.066
	Institution FTE	-.014	.030	-.027		-.468	.640
	Length in Production	-.106	.036	-.172		-2.994	.003

a. Dependent Variable: Effective

b. Selecting only cases for which Governance Model <= 5

Appendix E—Self-identified Institutions

Table 5 Self-identified Institutions and count of respondents

Institution:		1
Aga Khan University	Seminole Community College	
	1 Seminole Community College	
Arizona State University		2
Arizona State University	Simon Fraser University	
	2 Simon Fraser University	
Berkeley Lab		2
	1 Southern Methodist University	
Binghamton University		1
	1 Southwestern Illinois College	
Binghamton University - SUNY		1
	1 St. Lawrence College	
Boise State University		1
Boise State University	The Australian National University	
	2	1
Bowling Green State University	The Brookings Institution	
	1	1
Bryn Mawr College	The Ohio State University	
	1 The Ohio State University	
BYU-Hawaii		2
	1 The RF of SUNY	
California State Polytechnic University, Pomona		1
	The University of Akron	
	1	1
Clemson University	The University of Kansas	
	1	1
College of the North Atlantic	The University of Queensland	
	1	1
College of the North Atlantic - Qatar	Towson university	
	1	1
College of the North Atlantic-Qatar	Tufts University	
	1	1
Creighton University	UMBC	
	1 UMBC	
CSU - Chancellor's Office		2
	1 Université Laval	
CUNY York College	Université Laval	
	1	2
DePaul University	University at Albany	
	1 University at Albany	
Emory University		2
Emory University	University of Adelaide	
	2	1
Florida State University	University of Calgary	
Florida State University		1
	2 University of Cambridge	
Georgia Institute of Technology		1
	1 University of Cape Town	
Grand Rapids CC		1
	1 University of Colorado	

Griffith University		1
Harvard University	1 University of Connecticut	1
Ithaca College	1 University of Delaware	1
James Madison University	1 University of Florida	1
Kansas State University	1 University of Kansas	1
La Cité collégiale	1 University of Maine	1
Liverpool John Moores University	1 University Of Maine System University of Maine System	2
Long Beach City College	1 University of Maryland University College	1
Los Rios Community College District	1 University of Massachusetts	1
Louisiana State University Health Sciences Center-New Orleans	1 University of Massachusetts Medical School	1
LSU Health Science Center	1 University of Michigan	1
Marquette University	1 UNIVERSITY OF MISSOURI	1
Metropolitan Community Colleges-Kansas City	1 University of North Texas Health Science Center	1
MICA	1 University of Northern Iowa	1
Moody Bible Institute	1 University of Oklahoma Health Sciences Center	1
Moody Bible Institute	1 University of Pretoria SA	1
NAIT	1 University of Queensland	1
NC State University	1 University of Southern Queensland	1
Nevada System of Higher Education Nevada System of Higher Education	2 University of Wisconsin - Madison University of Wisconsin - Madison	2
New Jersey City University	1 University of Wisconsin System	1
new york law school	1 University of Wisconsin-Madison	1
nicolet area technical college	1 University of Wisconsin-Milwaukee	1
Northern Arizona University	1 UW - Milwaukee	1
Northern Illinois University	1 UW Stout	1
Northwestern University	1 Virginia Tech	1
Northwestern University	2 Virginia's Community Colleges	1

NYU Medical Center		1
Queens College, CUNY	1	Walla Walla University
RMIT	1	West Virginia University
Santa Clara University	1	
York College, City University of New York		1

Appendix F—Descriptive Statistics

<i>Public Private Funding</i>		<i>Institution FTE</i>		<i>Carnegie Classification</i>	
Mean	1.413461538	Mean	4.141025641	Mean	2.685897436
Standard Error	0.027924513	Standard Error	0.094460451	Standard Error	0.076591716
Median	1	Median	4	Median	2
Mode	1	Mode	6	Mode	2
Standard Deviation	0.493245246	Standard Deviation	1.668504222	Standard Deviation	1.352879445
Sample Variance	0.243290873	Sample Variance	2.78390634	Sample Variance	1.830282793
Kurtosis	-	Kurtosis	-1.41168159	Kurtosis	0.176730088
	1.887419682				
Skewness	0.353158089	Skewness	-0.21679655	Skewness	1.040384852
Range	1	Range	5	Range	5
Minimum	1	Minimum	1	Minimum	1
Maximum	2	Maximum	6	Maximum	6
Sum	441	Sum	1292	Sum	838
Count	312	Count	312	Count	312

<i>Length in Production</i>		<i>Governance Model</i>		<i>Effectiveness</i>	
Mean	4.131410256	Mean	2.788461538	Mean	1.983974359
Standard Error	0.078871755	Standard Error	0.084329429	Standard Error	0.049621358
Median	4	Median	2	Median	2
Mode	5	Mode	2	Mode	2
Standard Deviation	1.393152962	Standard Deviation	1.489554695	Standard Deviation	0.876487934
Sample Variance	1.940875175	Sample Variance	2.218773188	Sample Variance	0.768231099
Kurtosis	-	Kurtosis	-	Kurtosis	0.061472005
	0.501370103		0.143416906		
Skewness	-	Skewness	1.166070316	Skewness	0.434895379
	0.588450942				
Range	5	Range	5	Range	4
Minimum	1	Minimum	1	Minimum	0
Maximum	6	Maximum	6	Maximum	4
Sum	1289	Sum	870	Sum	619
Count	312	Count	312	Count	312

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